TREV. TRIALS P1 2017

Question 1

a) Sub $(0;0)$: $0 = -2^0 + q$ ✓m

$0 = -1 + q$ ✓a

$q = 1$ (2) K

b) $y = -2^1 + 1$ ✓m

$y = -1$

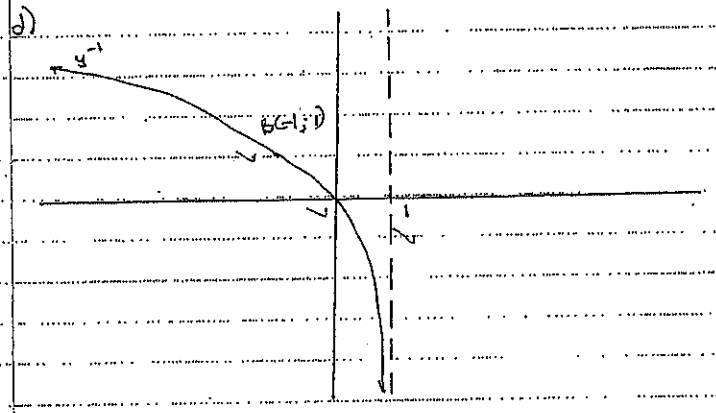
$\therefore p = -1$ ✓a (2) K

c) For inverse $x \leftrightarrow y$: $x = -2^y + 1$ ✓m

$2^y = 1 - x$ ✓a

$\log_2(1-x) = y$ ✓a (3) K

d)



(3) K

[10]

Question 2

a) $(0;1)$ is a common point ✓m

$\therefore 1 = -(0-1)^2 + b$ ✓a

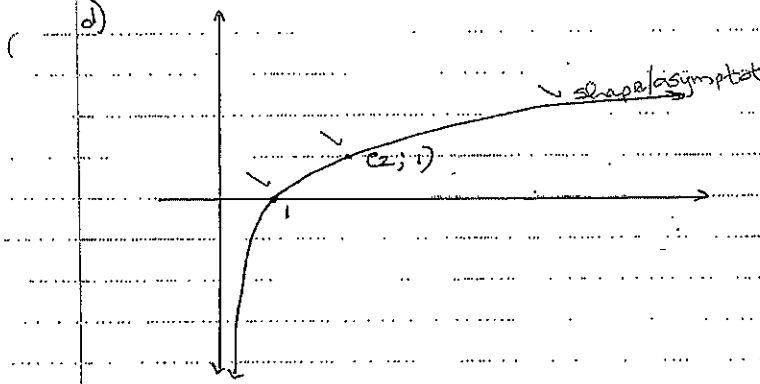
$1 = -1 + b$

$b = 2$ (2) K

b) T.P. of $g = (1;2)$ ✓ (1) K

c) $y = \log_2 x$ ✓ (1) K

d)



(3) K

e) $g(x+1) = -(x+1-1)^2 + 2$ ✓

$= -x^2 + 2$

$g(x+1) - 2 = -x^2$ ✓

$\therefore h(x) = -x^2$ (2) C

f) $x \geq 0$ or $x \leq 0$ ✓either case (1) K

g) Max when $2-(x-1)^2$ is max.

max of $2-(x-1)^2 = 2$ ✓

$\therefore$ max of $2^{2-(x-1)^2} = 4$ ✓ (2) PS

[12]

Question 3

a) For $f(x) < 0$, $x^2 + 1 < 0$ ✓

$x^2 < -1$ ✓

N/S

$\therefore f(x)$ will never be negative / $x \in \emptyset$ ✓2

a) $\frac{\sqrt{(x^2+1)^3}}{3} = 72$ ✓

$\sqrt{(x^2+1)^3} = 216$ ✓

$(x^2+1)^3 = 46656$

$x^2 + 1 = 36$ ✓

$x^2 = 35$

$x = \pm\sqrt{35}$ ✓

(4)

b) $f(a) = \frac{\sqrt{(a^2+1)^3}}{3}$

when: $a = 0$ ✓OR

$a^2 + 1 = 4$ ✓

$a^2 = 3$

$a = \pm\sqrt{3}$ ✓ (3)

c) $f(a) = \frac{\sqrt{(a^2+1)^3}}{3}$

$= \frac{\sqrt{(a^2+1)^2(a^2+1)}}{3}$ ✓✓

$= \frac{(a^2+1)\sqrt[3]{(a^2+1)}}{3}$ ✓

(2)

Question 4

a) $F = \frac{850\left[\left(1 + \frac{0,075}{12}\right)^{66} - 1\right]}{\frac{0,075}{12}}$ ✓

$= R69\,176,62$ ✓ (3) K

b) $x\frac{\left[\left(1 + \frac{0,075}{12}\right)^{66} - 1\right]}{\frac{0,075}{12}} = 80\,000$ ✓ equating

$x = R982,99$ ✓

$\therefore$ Alex must invest R132,99 ✓ more per month. (4) R

c) $F = \frac{1000\left[\left(1 + \frac{0,075}{12}\right)^{38} - 1\right]}{\frac{0,075}{12}}$ ✓

$= R42\,742,10$ ✓

Amount still needed = R37 257,90 ✓

$\frac{860\left[\left(1 + \frac{0,075}{12}\right)^{n} - 1\right]}{\frac{0,075}{12}} = 37257,90$ ✓

$\left(1 + \frac{0,075}{12}\right)^{n} = 1,2707\ldots$

$n = \log_{\left(1+\frac{0,075}{12}\right)} 1,2707\ldots$ ✓ log form

$= 38,5 \approx 39$ ✓

$\therefore$ It would take Alex a total of 77 months. (7) C

[14]

Question 5

a) $f(-1) = 0$ ✓
$f(2) = 0$ ✓
$\therefore$ Average gradient $= 0$ ✓ (3) K

b) $f(p+h) = (p+h)+1)(p+h)-2)$ ✓sub $p^2 - p - 2 = f(p)$
$= (p+h)^2 - (p+h) - 2$
$= p^2 + 2ph + h^2 - p - h - 2$ ✓ $f(p+h) = (p+h)^2 - (p+h) - 2$
$f(p+h) - f(p) = 2ph - h + h^2$ ✓

$f'(p) = \lim_{h \to 0} \frac{2ph - h + h^2}{h}$ ✓

$= \lim_{h \to 0} (2p - 1 + h)$

$= 2p - 1$ ✓ (5) R/C

c) $f'(-1) = -3$ ✓ca
$f'(2) = 3$ ✓ca (2) K

d) $y_1 = -3(x+1)$ ✓ $y_2 = 3(x-2)$ ✓
$= -3x - 3$ $= 3x - 6$

$\therefore 3x - 6 = -3x - 3$ ✓
$6x = 3$
$x = \frac{1}{2}$ ✓ $(\frac{1}{2}; -\frac{9}{2})$ C
$\therefore y = -\frac{9}{2}$ ✓ (5) ~~K~~

e) $f(p) = p^2 - p - 2$ ✓ (mark could be allocated in b)
A.o.S.: $x = \frac{-(-1)}{2a}$ ✓
$= \frac{1}{2}$ $\therefore$ Pt of intersection lies on axis of symmetry (3) R.
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Question 6

a) $\frac{dy}{dx} = 20x^3 + 14x^{-3}$ ✓ ✓ (2) K

b) $y = x^{\frac{5}{3}} - 11x^{\frac{1}{2}} + 7$ ✓ 3
$\therefore \frac{dy}{dx} = \frac{5}{3}x^{\frac{2}{3}} - \frac{11}{2}x^{-\frac{1}{2}}$ ✓ $\frac{dy}{dx} = 0$ (3) K

Section B

Question 7.

a) 1) $P(\text{both}) = 0,05 \times 0,05$ ✓

$= \frac{1}{400}$ or $0,0025$ ✓ (2) K

2) $P(\text{exactly 1}) = 0,05 \times 0,95 + 0,95 \times 0,05$ ✓ ✓

$= \frac{19}{200}$ $(0,095)$ (2) K.

b) 1) $n = \frac{17!}{(17-9)!}$ ✓ $= 8\,821\,612\,800$ ✓ (3) R.

2) 5 girls: $\frac{9!}{4!}$ (#) 4 boys: $\frac{8!}{4!}$ ✓

$= 16800$. ✓ (3) R

3) No of ways called up $= 9! = 362\,880$

No of ways 3 girls called up $= 4! \times 3!$ ✓ ✓

$= 144$ ✓

$\therefore P(\text{3 girls}) = \frac{144}{362\,880}$

$= \frac{1}{2520}$ ✓

$\frac{4}{9} \times \frac{5}{8} \times \frac{4}{7}$ (no marks)

$\frac{7 \times 3!}{9!}$ (2 marks)

Question 8.

a) $a = 100$ $r = 0,8$ ✓

$\therefore T_{15} = 100.(0,8)^{14}$ ✓

$= 4,4$ units ✓ (4) R.

b) $a = k$ $d = -1$ ✓

$\therefore T_{15} = k + 14(-1)$ ✓

$= k - 14$ ✓ (3) R

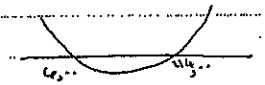
c) $S_n > 360°$ ✓

$\frac{n}{2}[2(60°) + (n-1)(-1)] > 360°$ ✓

$120n - n^2 + n > 720°$

$-n^2 + 121n - 720° > 0$

$n^2 - 121n + 720° < 0$ ✓



$\therefore 6 < n < 114$ ✓ ✓ (6) R

d) $S_\infty = \frac{100}{1 - 0,8}$ ✓

$= 500$ mm ✓ (2) K.

e) $S_{103} = \frac{100(1 - 0,8^{103})}{0,2}$ ✓ $S_{104} = \frac{100(1 - 0,8^{104})}{0,2}$ ✓

$= 499,9$ ✓ $= 500$ ✓

$\therefore n = 104$ is minimum number of repeats ✓ conditional mark (4) C

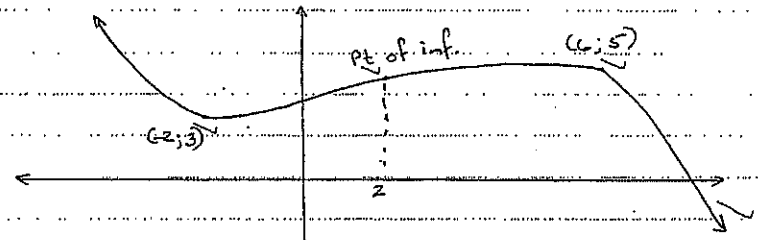
[10]

Question 9.

a) $x < -2$ or $x > 6$ (2) K

b) $x > 2$ (1) K

c)



(4) C

[7]

Question 10

a) $r^2 = 36 - h^2$ Pythag

$\therefore V = \frac{1}{3}\pi(36 - h^2)h$

$= \frac{1}{3}(36\pi h - \pi h^3)$

$= 12\pi h - \frac{\pi}{3}h^3$ (3) C

b) Max Vol when $\frac{dV}{dh} = 0$

$\therefore 12\pi - \pi h^2 = 0$

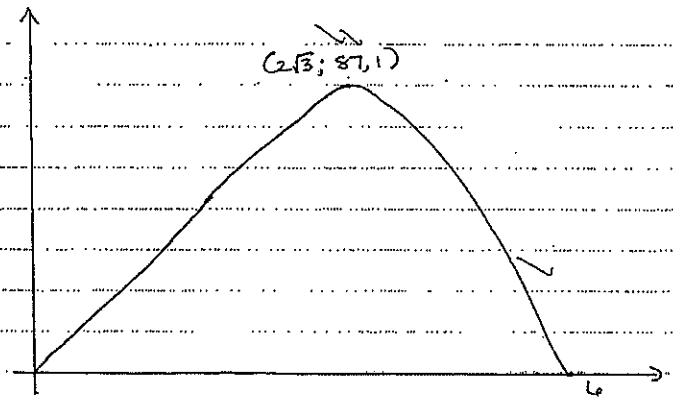
$12 = h^2$

$h = 2\sqrt{3}$ $\therefore r = 2\sqrt{6}$ (5) C

c) $V = 12\pi(6) - \frac{\pi}{3}(6)^3$

$= 0$ (2) K

d)



(3) C

[13]

Question 11

a) Volume = Area of base × h

$= x^2 \times h$

$= x^2 \times 3x$

$= 3x^3$

$\therefore a = 3$ (3) C

b) $V\left(\frac{14}{3}\right) = m$

$\therefore 3\left(\frac{14}{3}\right)^3 = m$

$m = \frac{2744}{9}$ 304,59 (2) K

c) i) $QT = 14x^2 - 3x^3$ (2) K

ii) Max' when $VT' = 0$

$\therefore 28x - 9x^2 = 0$

$x(28 - 9x) = 0$

$x = 0$ or $x = \frac{28}{9}$

N/A

$\therefore$ Max length $= 14\left(\frac{28}{9}\right)^2 - 3\left(\frac{28}{9}\right)^3$

$= \frac{10\,976}{243} = 45,17$ (6) R

Question 12

a) $68,41 = 75 - 6\log_x(2+1)$

$6\log_x 3 = 75 - 68,41$

$\log_x 3 = \frac{6,59}{6}$

$x^{\frac{659}{600}} = 3$

$\therefore x = 2,719$ (4) P.S.

b) $P = 75 - 6\log_{2,719}(14+1) = 58,8$ (2) K

c) $75 - 6\log_{2,719}(t+1) \leq 50$

$\log_{2,719}(t+1) \geq \frac{25}{6}$

$t + 1 \geq 65$

$t \geq 64$ days (4) P.S.

d) $68,41 = 75 - 6\log_x(4+1)$

$6\log_x 5 = \frac{6,59}{100}$

$\log_x 5 = \frac{659}{600}$

$x^{\frac{659}{600}} = 5$

$x = 4,33$ (3) P.S.

[13]